

OptiMOS®2 Power-Transistor

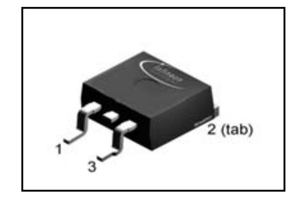
Product Summary

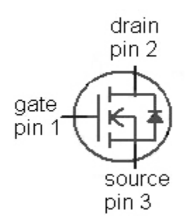
V_{DS}	25	V
$R_{DS(on),max}$ (SMD version)	13.6	mΩ
I_D	30	A

Features

- Ideal for high-frequency dc/dc converters
- Qualified according to JEDEC[1] for target applications
- N-channel - Logic level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Superior thermal resistance
- 175 °C operating temperature
- dv/dt rated
- Pb-free lead plating; RoHS compliant

PG-TO263-3-2





Type	Package	Marking
IPB14N03LA G	PG-TO263-3-2	14N03LA

Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C=25 °C[2]	30	A
		T_C=100 °C	30	
Pulsed drain current	$I_{D,pulse}$	T_C=25 °C[3]	210	
Avalanche energy, single pulse	E_{AS}	I_D=24 A, R_{GS}=25 Ω	60	mJ
Reverse diode dv/dt	dv/dt	I_D=30 A, V_{DS}=20 V, di/dt=200 A/µs, $T_{j,max}$=175 °C	6	kV/µs
Gate source voltage[4]	V_{GS}		±20	V
Power dissipation	P_{tot}	T_C=25 °C	46	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

[1] J-STD20 and JESD22

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	3.2	K/W
SMD version, device on PCB	R_{thJA}	minimal footprint	-	-	62	
		6 cm^2 cooling area[5)]	-	-	40	

Electrical characteristics, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=1 mA	25	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=20 µA	1.2	1.6	2	
Zero gate voltage drain current	I_{DSS}	V_{DS}=25 V, V_{GS}=0 V, T_j=25 °C	-	0.1	1	µA
		V_{DS}=25 V, V_{GS}=0 V, T_j=125 °C	-	10	100	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=4.5 V, I_D=20 A, SMD version	-	18.2	22.7	mΩ
		V_{GS}=10 V, I_D=30 A, SMD version	-	11.3	13.6	
Gate resistance	R_G		-	0.9	-	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=30 A	17	35	-	S

2) Current is limited by bondwire; with an R_{thJC}=3.2 K/W the chip is able to carry 45

3) See figure 3

4) $T_{j,max}$=150 °C and duty cycle D<0.25 for V_{GS}<-5 V

5) Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

5 Diagrams are related to straight lead versions.

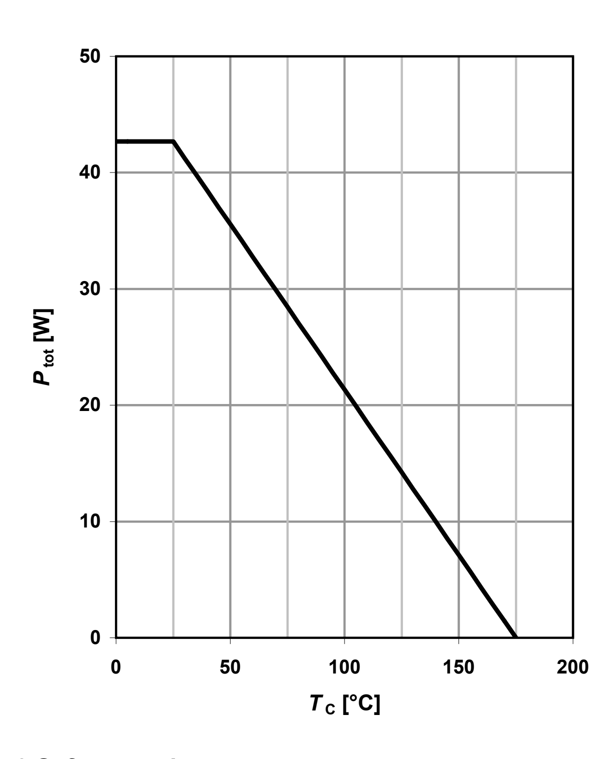
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz	-	784	1043	pF
Output capacitance	C_{oss}		-	303	402	
Reverse transfer capacitance	C_{rss}		-	41	62	
Turn-on delay time	$t_{d(on)}$	V_{DD}=15 V, V_{GS}=10 V, I_D=15 A, R_G=2.7 Ω	-	7.0	10	ns
Rise time	t_r		-	33	41	
Turn-off delay time	$t_{d(off)}$		-	17	26	
Fall time	t_f		-	2.6	3.9	
Gate Charge Characteristics[6)]						
Gate to source charge	Q_{gs}	V_{DD}=15 V, I_D=15 A, V_{GS}=0 to 5 V	-	2.7	3.6	nC
Gate charge at threshold	$Q_{g(th)}$		-	1.3	1.7	
Gate to drain charge	Q_{gd}		-	1.8	2.7	
Switching charge	Q_{sw}		-	3.3	4.7	
Gate charge total	Q_g		-	6.3	8.3	
Gate plateau voltage	$V_{plateau}$		-	3.5	-	V
Gate charge total, sync. FET	$Q_{g(sync)}$	V_{DS}=0.1 V, V_{GS}=0 to 5 V	-	5.5	7.3	nC
Output charge	Q_{oss}	V_{DD}=15 V, V_{GS}=0 V	-	6.6	8.7	
Reverse Diode						
Diode continous forward current	I_S	T_C=25 °C	-	-	30	A
Diode pulse current	$I_{S,pulse}$		-	-	210	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=30 A, T_j=25 °C	-	0.98	1.2	V
Reverse recovery charge	Q_{rr}	V_R=15 V, I_F=I_S, di_F/dt=400 A/µs	-	-	10	nC

6) See figure 16 for gate charge parameter definition



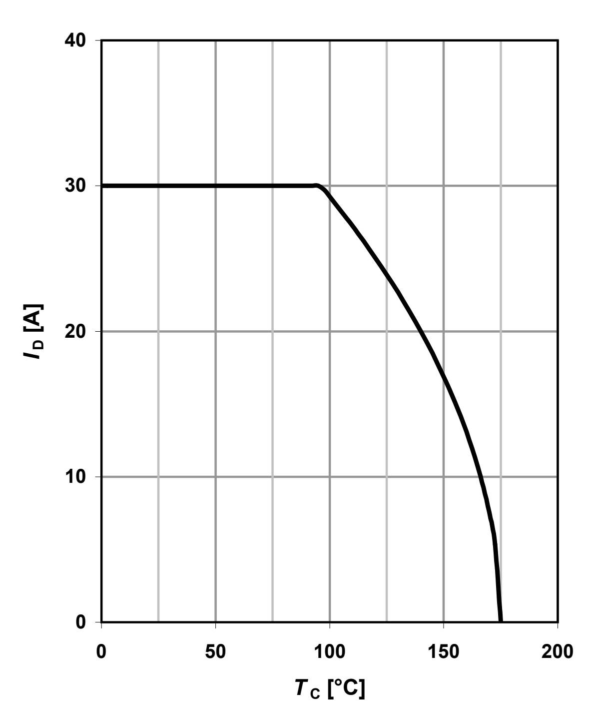
1 Power dissipation

P_{tot}=f(T_C)



2 Drain current

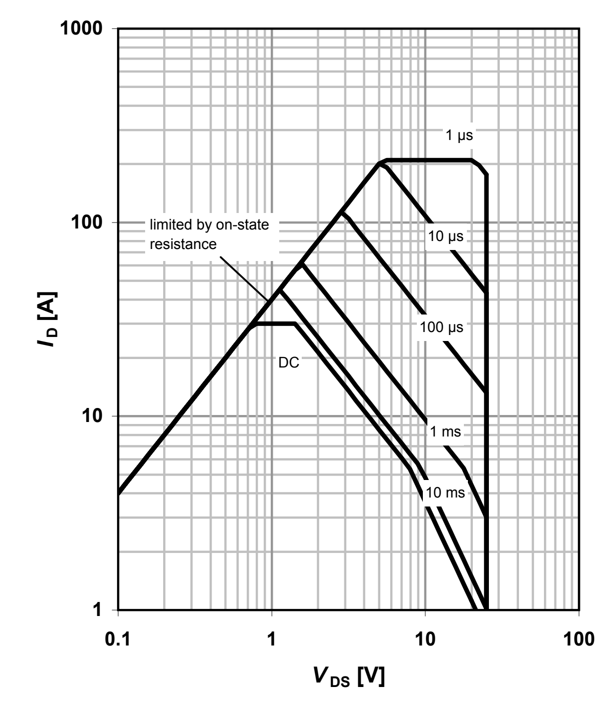
I_D=f(T_C); V_{GS}≥10 V



3 Safe operating area

I_D=f(V_{DS}); T_C=25 °C; D=0

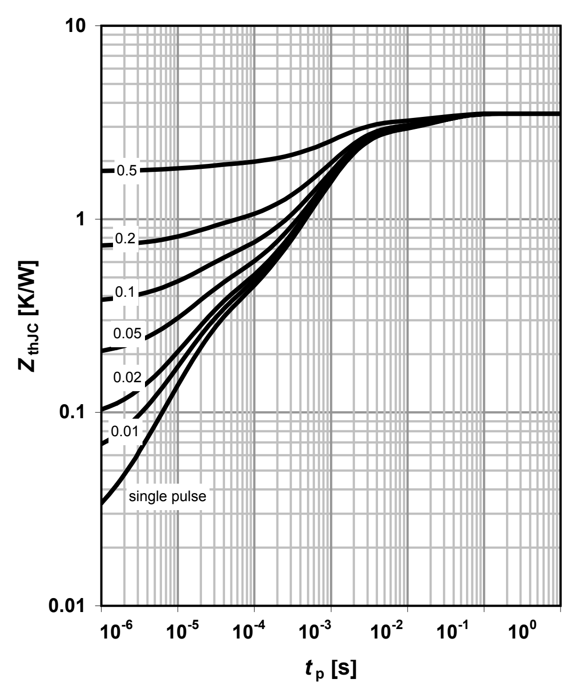
parameter: t_p



4 Max. transient thermal impedance

Z_{thJC}=f(t_p)

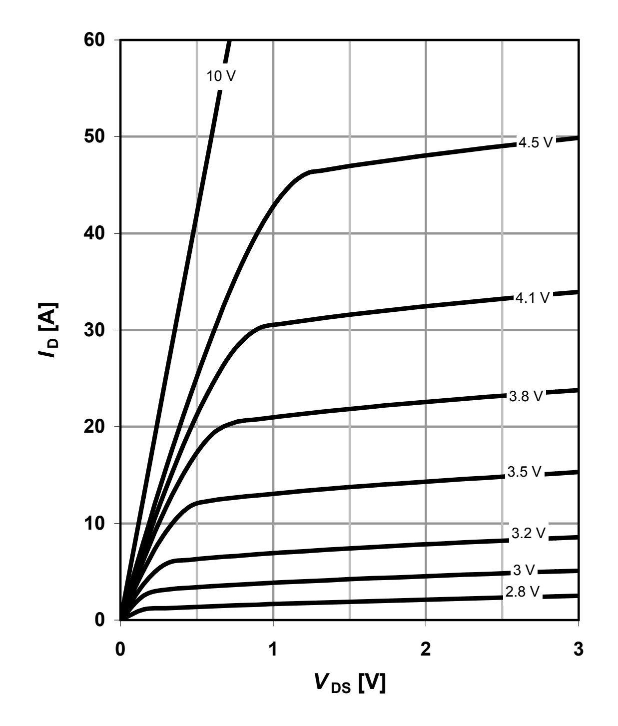
parameter: $D=t_p/T$



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=25 °C

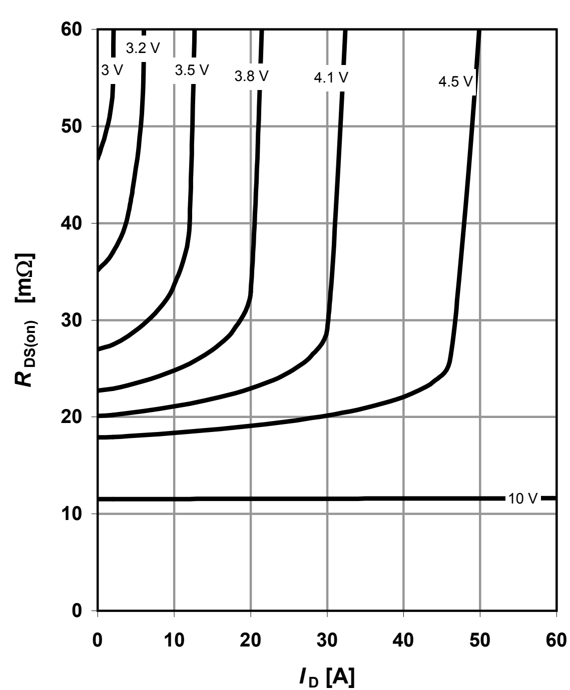
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}$=f(I_D); T_j=25 °C

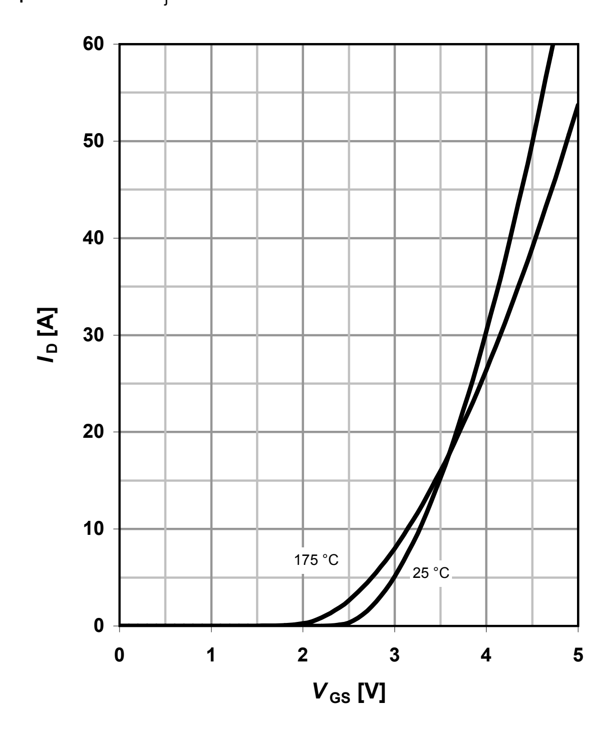
parameter: V_{GS}



7 Typ. transfer characteristics

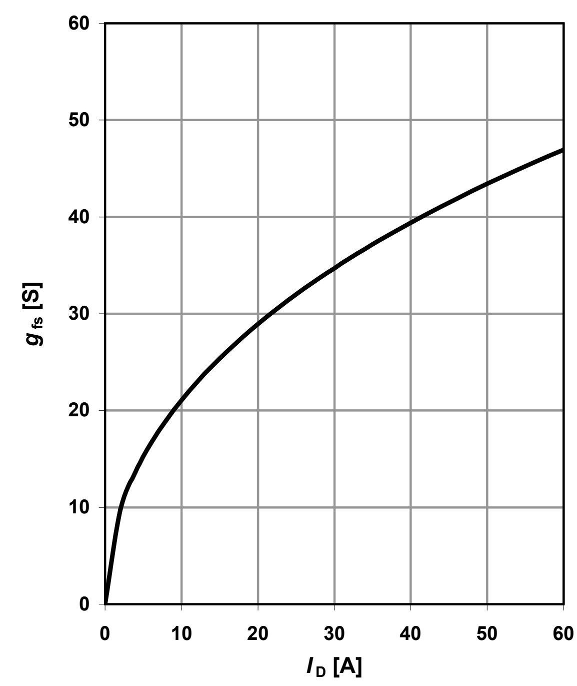
I_D=f(V_{GS}); $|V_{DS}|$>2$|I_D|R_{DS(on)max}$

parameter: T_j



8 Typ. forward transconductance

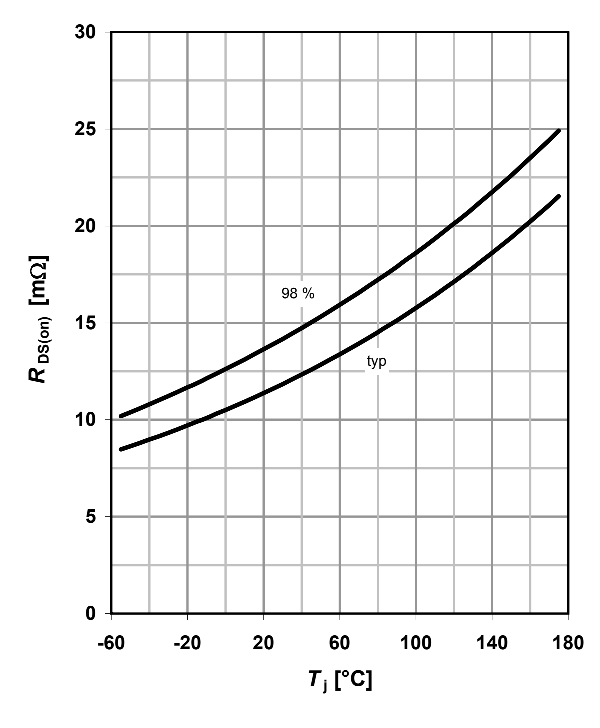
g_{fs}=f(I_D); T_j=25 °C





9 Drain-source on-state resistance

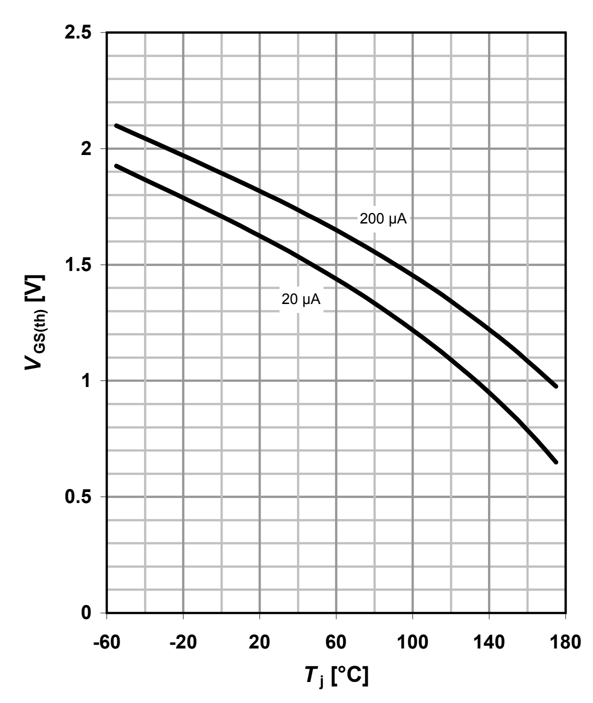
$R_{DS(on)}$=f(T_j); I_D=30 A; V_{GS}=10 V



10 Typ. gate threshold voltage

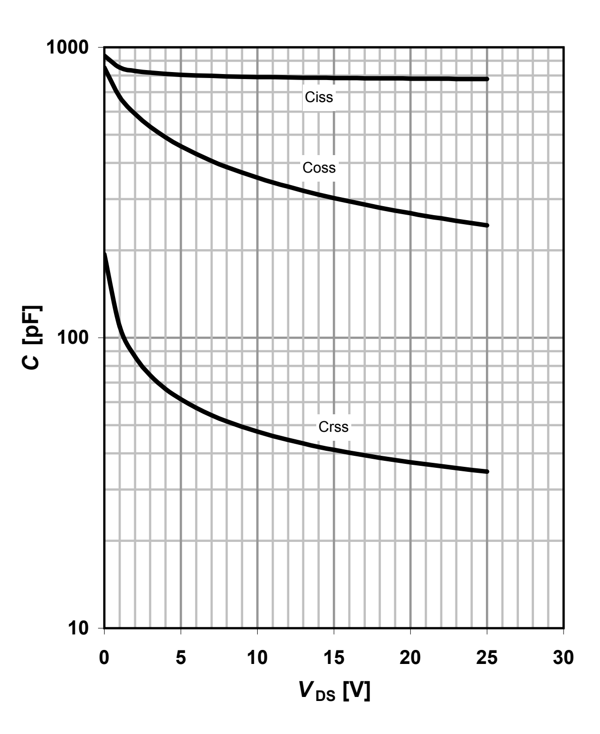
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}

parameter: I_D



11 Typ. Capacitances

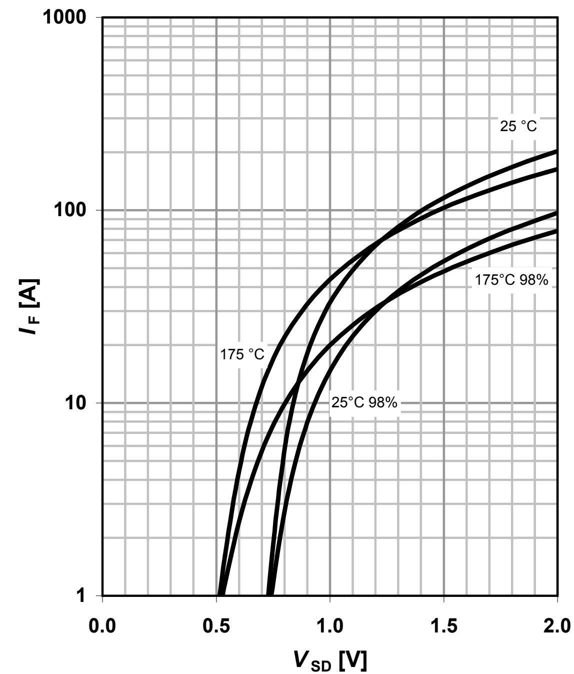
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz



12 Forward characteristics of reverse diode

I_F=f(V_{SD})

parameter: T_j





13 Avalanche characteristics

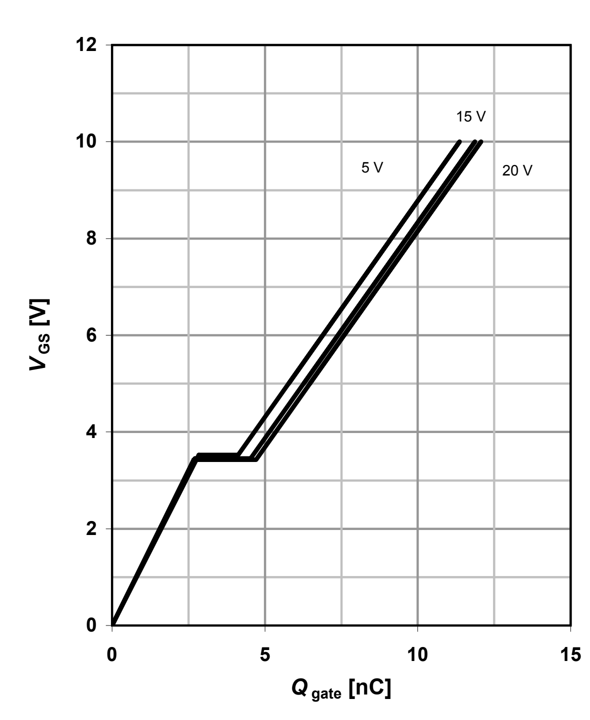
I_{AS}=f(t_{AV}); R_{GS}=25 Ω

parameter: $T_{j(start)}$

14 Typ. gate charge

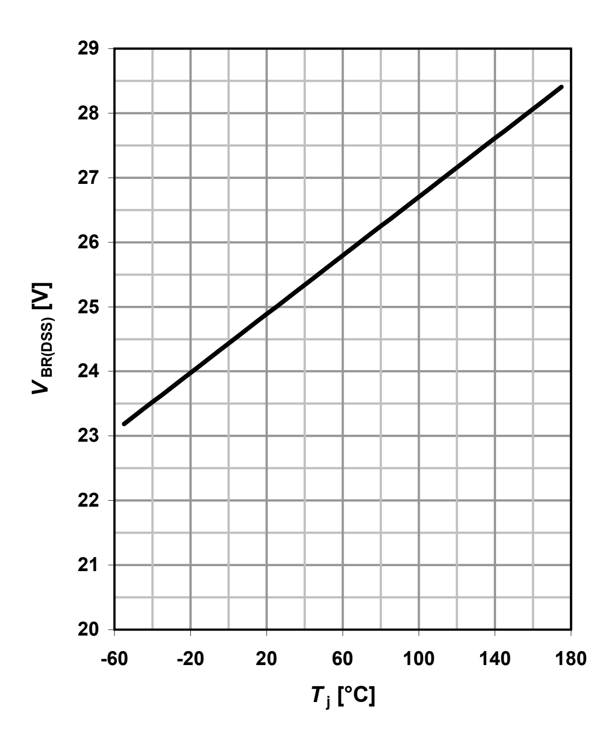
V_{GS}=f(Q_{gate}); I_D=15 A pulsed

parameter: V_{DD}

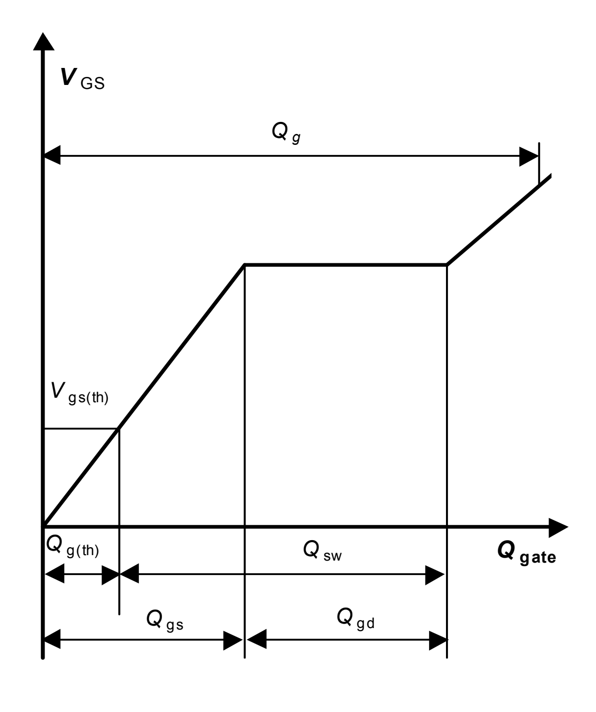


15 Drain-source breakdown voltage

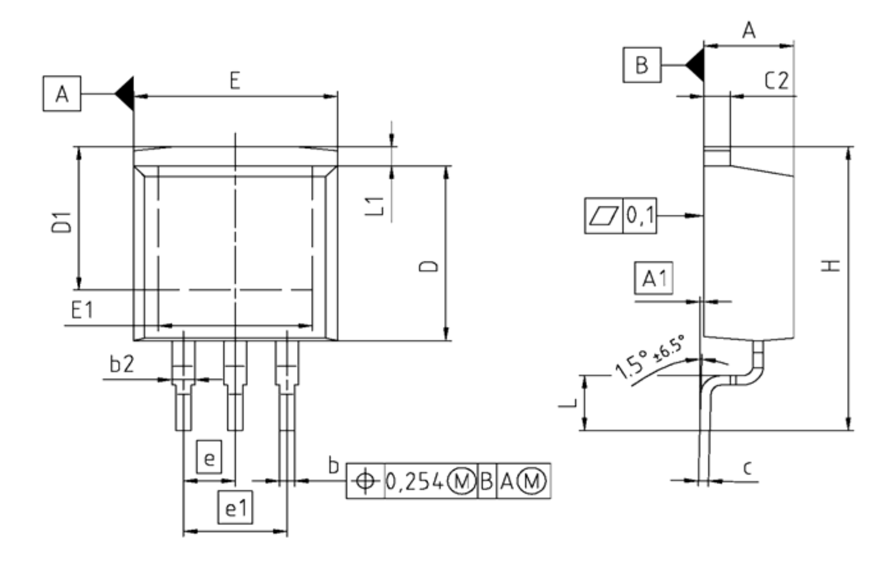
$V_{BR(DSS)}$=f(T_j); I_D=1 mA

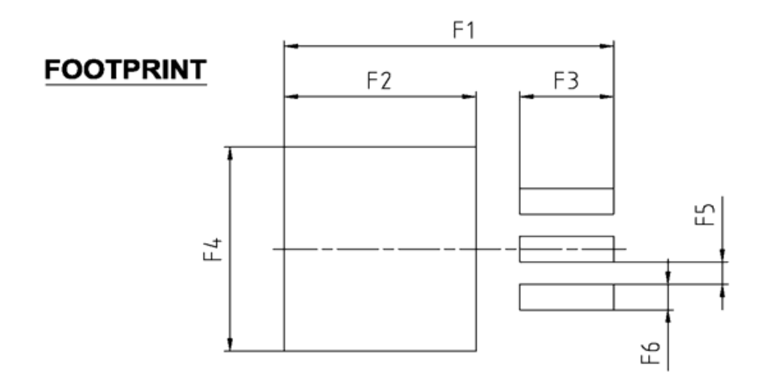


16 Gate charge waveforms

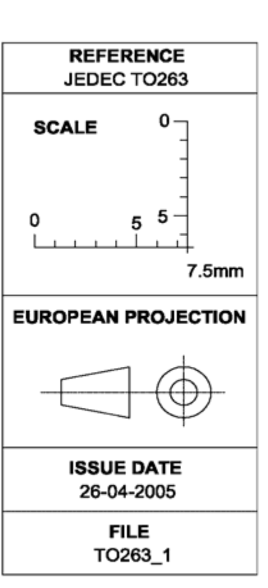


Package Outline **PG-TO263-3-2**





DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.300	4.572	0.169	0.180
A1	0.000	0.254	0.000	0.010
b	0.650	0.850	0.026	0.033
b2	0.950	1.321	0.037	0.052
c	0.330	0.650	0.013	0.026
c2	0.170	1.400	0.046	0.055
D	8.509	9.450	0.335	0.372
D1	7.100	-	0.280	-
E	9.800	10.312	0.386	0.406
E1	6.500		0.256	
e	2.540		0.100	
e1	5.080		0.200	
N	3		3	
H	14.605	15.875	0.575	0.625
L	2.200	3.000	0.087	0.118
L1	-	1.600	-	0.063
F1	16.050	16.250	0.632	0.640
F2	9.300	9.500	0.366	0.374
F3	4.500	4.700	0.177	0.185
F4	10.700	10.900	0.421	0.429
F5	1.250	1.450	0.049	0.057
F6	1.100	1.300	0.043	0.051



Published by
Infineon Technologies AG
81726 München, Germany

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